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(54) Abstract Title
Flexible hollow electrical cable

(57) A hollow flexible tubular electrical conductor comprises individually-insulated metal wire woven, plaited, knitted or spirally-wrapped into a tubular form which is embedded in and/or impregnated with a flexible electrically-insulating material. The individual insulation of each wire minimises eddy currents. A hollow tube 1 has a passage 2 for water and layers 3, 4 of copper filaments impregnated with polyurethane or rubber. The conductor is used for gradient coils in MRI, an induction furnace or diathermy coils.

FIG .1

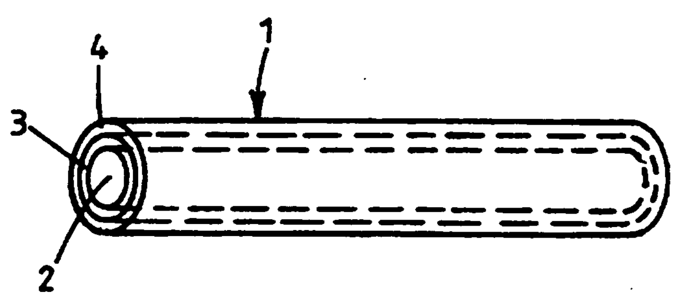

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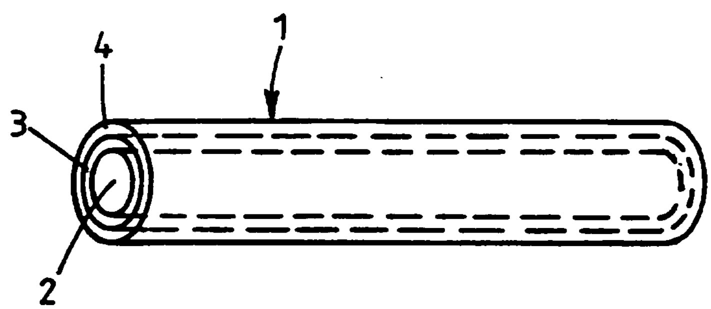
FIG .1



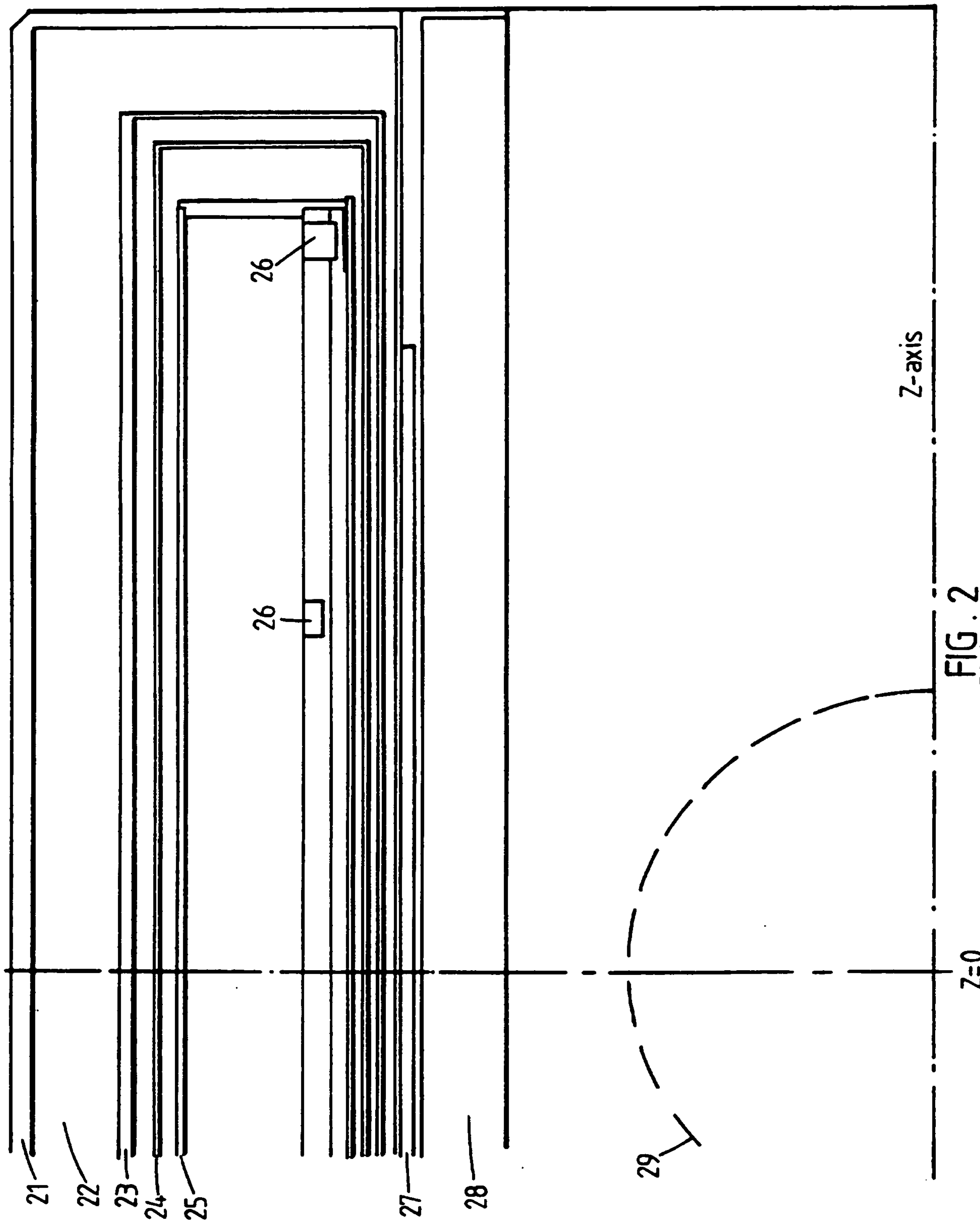


FIG. 2
PRIOR ART

FIG. 3A
PRIOR ART

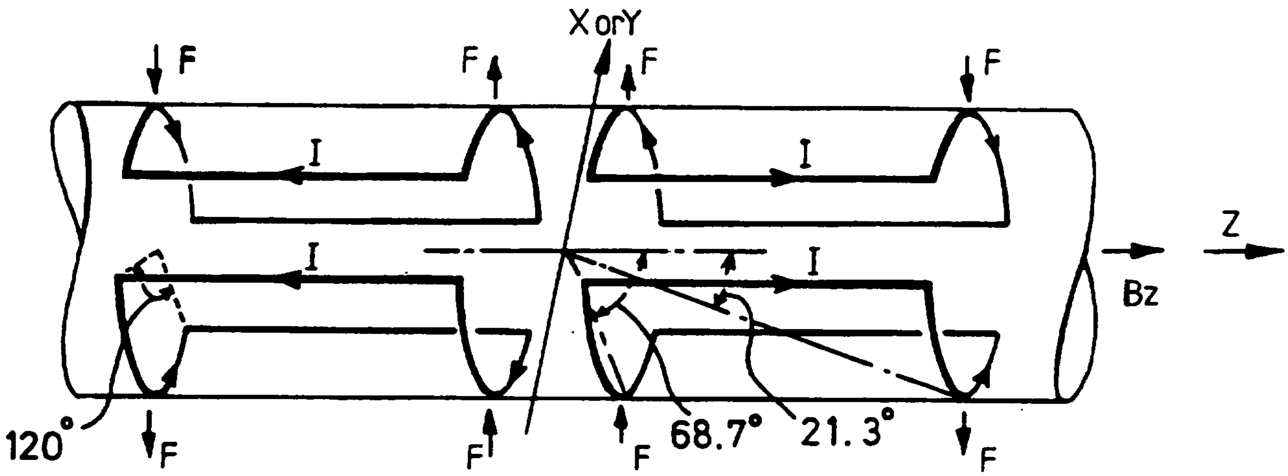
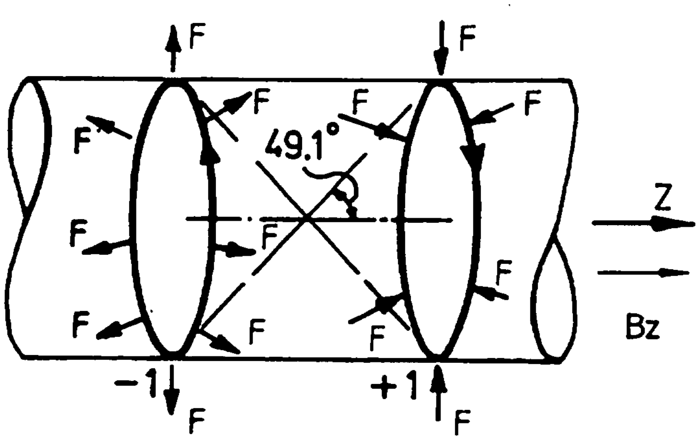


FIG. 3B
PRIOR ART



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Hollow, Flexible, Tubular, Electrical Conductor

This invention relates to a hollow, flexible, tubular electrical conductor which is suitable for, although not exclusively for, use in gradient coils for magnetic resonance imaging systems (MRI).

The present invention has arisen from development work on MRI systems incorporating whole-body gradient coils which can be used either for conventional imaging or more particularly for ultra-fast imaging. Such systems are well known, and need not be discussed in detail here in this specification. The direction of the static magnetic field is called the Z axis, which is the reference direction for the system. The static field is referred to as Bz and the two orthogonal directions are the X and Y axes. There are three sets of gradient coils, X, Y and Z which respectively generate field gradients dBz/dX, dBz/dY and dBz/dZ.

The gradient coils and the radio frequency coils are pulsed on for times ranging from one millisecond to some tens of milliseconds. As is well known, by suitable choices of pulse sequence, pulse length and other parameters, the system is able to reveal a wide range of information about the medical subject, for example to contrast between healthy and diseased tissue, or to highlight blood vessels according to blood velocity.

A number of problems arise from the pulse of the gradient fields. Although the static magnet is a dipole whilst the gradient coils are quadrupoles, they are not orthogonal in an MRI system because of their close proximity: there are many troublesome interactions. Ignoring ferromagnetic hysteretic effects, which principally affect iron-yoke magnets working at lower fields (these are considered in part in European Patent Application 645641), the following description concentrates on superconducting magnet systems which are basically axisymmetric solenoids. With these, the main problems are: